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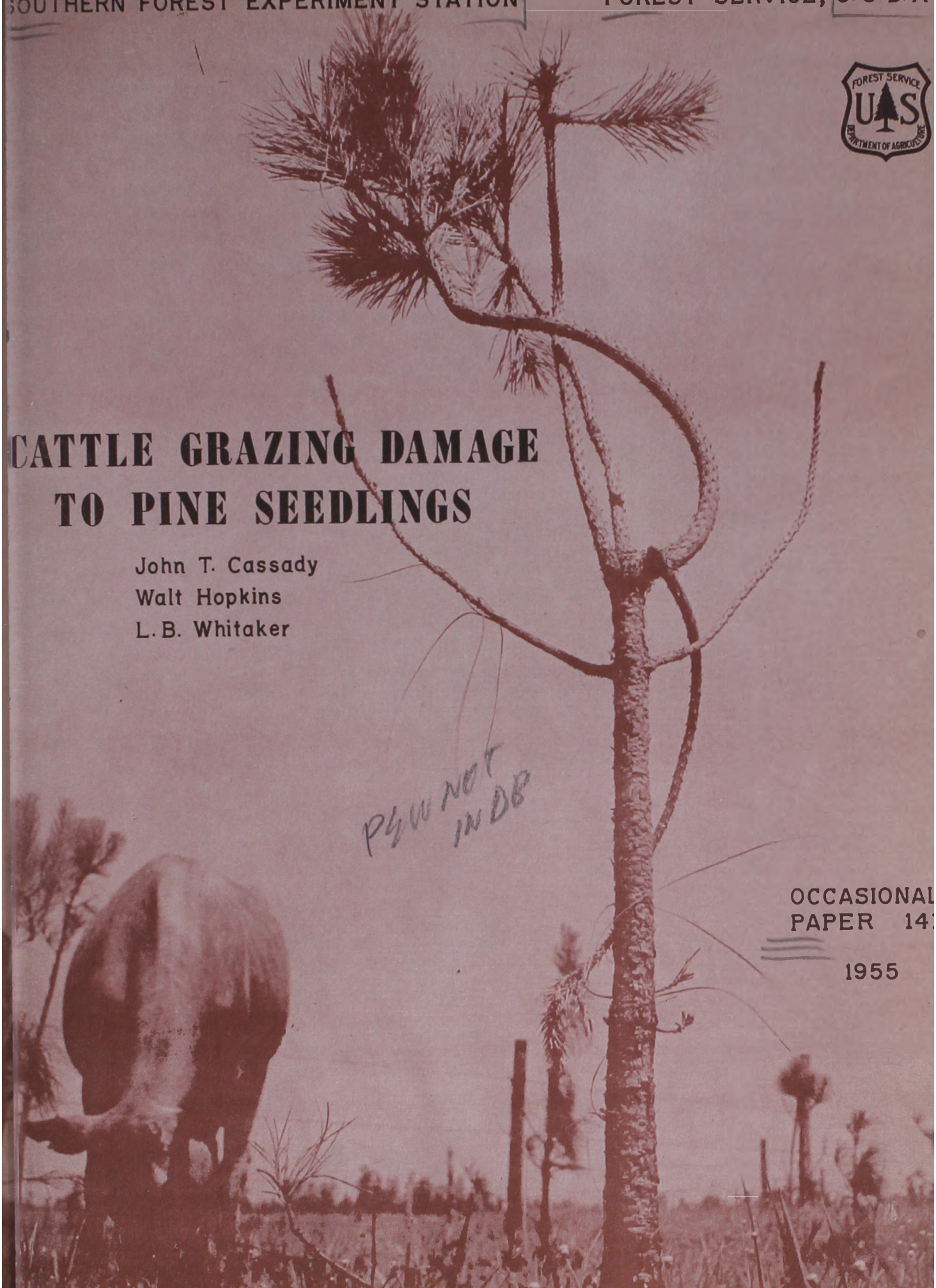

CATTLE GRAZING DAMAGE TO PINE SEEDLINGS

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Contents

Damage to Plantations 1
The Chandler Plantation 1
The Nebo Plantations 3
The Claiborne Plantation 5
The Longleaf Tract Grazing Study 6
The Long-Bell Plantation 10

Damage to Direct-seeded Areas. 11
Turnage Road 11
North Pasture 12
The Crosby Seeding Test 13

Summary and Recommendations 13

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CATTLE GRAZING DAMAGE TO PINE SEEDLINGS

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This paper summarizes pertinent information on the damage that grazing cattle have done to pine seedlings in several areas of central Louisiana.

Until recently, grazing damage has been of little or no concern to most forest landowners. Today, however, intensive land management is focussing attention on the problem. There are more cattle, more trees, less grass--and more foresters to observe the effects of grazing. The dry years since 1951 have no doubt intensified the situation.

The studies reported here were installed in areas where grazing damage was noticeably heavy. On only one tract was grazing controlled. The results are therefore not average. Instead, they represent the most serious damage encountered in pine plantations from 1946 to 1955 (see cover photo). The information, however, is reliable and can help guide landowners in deciding when cattle grazing can be permitted on areas where pine is being regenerated.

DAMAGE TO PLANTATIONS

The Chandler Plantation

Longleaf pine saplings on a National Forest plantation near Dry Prong, Louisiana, were heavily browsed by cattle during January and February 1947. The 10-year-old stand contained about 200 longleaf trees per acre; the trees ranged from 2 to 15 feet in height. The area also supported scattered to heavy stands of loblolly and shortleaf pines. These were not grazed.

The plantation consisted of 1,250 acres, all fenced. It had adequate amounts of native grass and was grazed most of the year by a herd of 60 to 90 beef cattle of average grade. When the trouble occurred, the cattle were being fed a winter ration of cottonseed meal that averaged

2.5 pounds per head daily--considerably more than Louisiana range cattle usually get.

The supplemental feeding was begun on December 31, during a severely cold, wet spell. Over 2 inches of rain, sleet, and snow fell during the first 3 days. Temperatures were freezing or below. Grasses and shrubs were coated with snow and ice.

As soon as feeding started, the cattle lost enthusiasm for grazing and spent most of their time waiting at the troughs. In less than a week, heavy grazing damage was noted on longleaf near the troughs. Before long, most of the cattle "got the habit" and spent an hour or more each day grazing solely on longleaf needles. Some cows would ride down saplings 10 feet high to reach the top foliage (fig. 1).

Pine grazing was measured on 48 one-quarter acre plots distributed evenly over 500 acres near the feeding ground. In addition, 50 saplings that had been completely defoliated were examined several times to determine rate and degree of recovery from damage. The main results and conclusions were:

1. Damage was concentrated near the feed troughs, but some pine grazing was evident in all parts of the pasture.

2. An average of 61 longleaf trees per acre were defoliated in some degree that first winter, but damage was negligible in 1948 and 1949.

3. Cattle browsed the needles only, not the buds and twigs.

4. The grazed trees suffered some loss in height growth but otherwise recovered quickly. Two percent of the defoliated seedlings died, while 86 percent recovered to good or excellent condition by the end of the first growing season.

5. The cattle preferred longleaf to loblolly and shortleaf foliage.

6. Evidently, this heavy longleaf browsing was stimulated by the cold spell and ice storm. Then the relatively large daily ration of high-protein feed apparently intensified the cows' appetite for green pine needles.

7. Analyses showed that during the winter the longleaf needles had higher quantities of essential nutrients than the native grass. The percentages of three important nutrients are tabulated on p. 3.

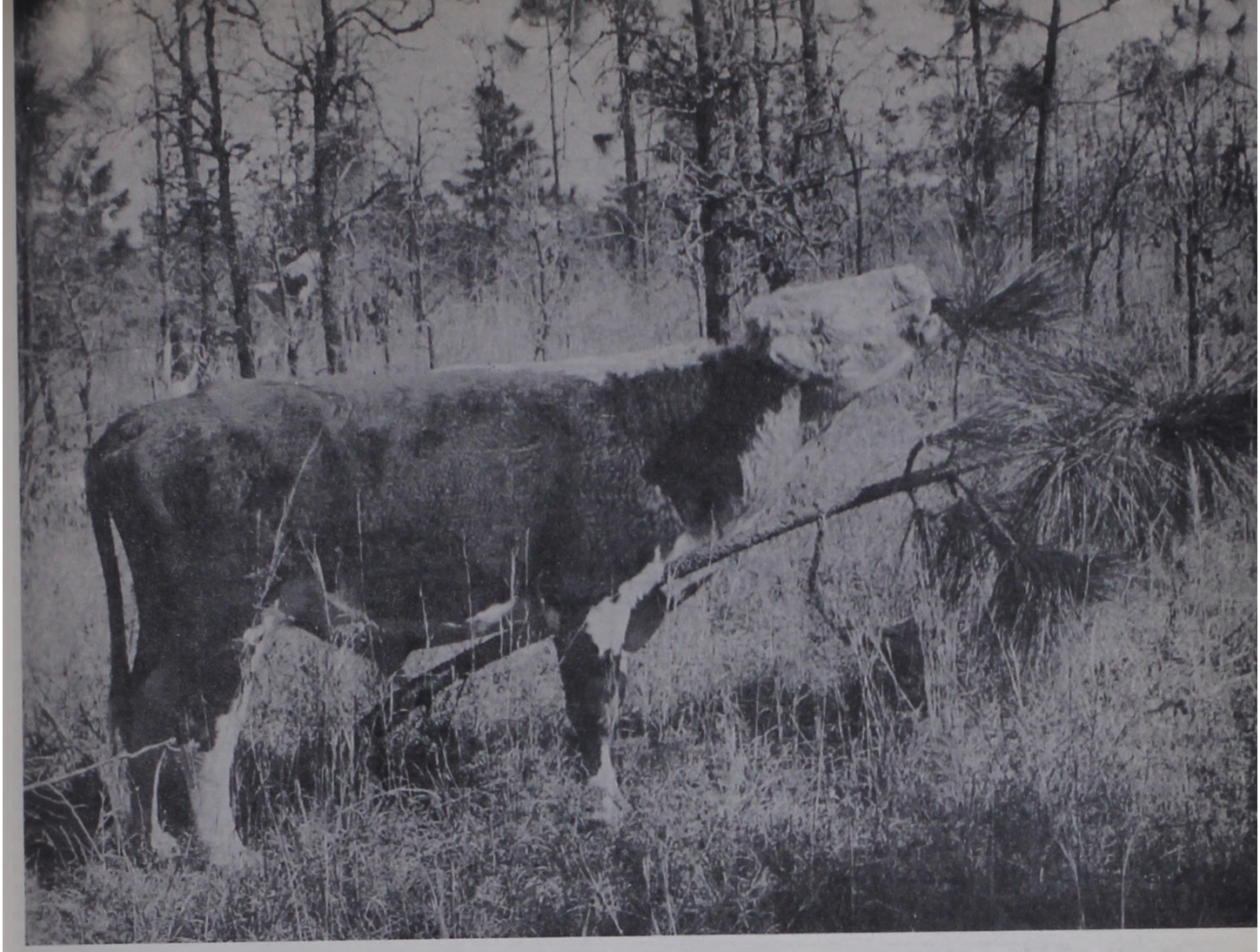

Figure 1.--Cattle often "ride down" sapling pines in order to browse foliage that would otherwise be out of reach.

Item	Crude protein	Fat	Phosphorus
Longleaf needles	7.8	6.6	0.22
Winter forage	5.4	2.6	.06

The Nebo Plantations

The Nebo Oil Company planted 4,000 acres of cutover land in La Salle parish during the winter of 1948-49. Most of the planting was slash pine.

Grass was sparse that winter, partly because the 1948 drought had kept forage production low and partly because nearly half the area had been burned a few weeks before planting. Then, the fall and winter rains filled the nearby bottoms, and floodwaters drove hundreds of open-range cattle to the newly planted uplands.

Heavy browsing of pine seedlings was reported in March 1949 and a grazing damage study was started in April. Very little evidence of trampling was seen, but 30 percent of the pines had their terminal buds nipped off. Grass became abundant in the spring of 1949 and no cattle damage was observed thereafter.

Trees on study plots were re-examined at the end of the first three growing seasons. The browsing did not increase seedling mortality. The survival of grazed and ungrazed seedlings was:

Season	Grazed trees	Ungrazed trees
	Percent surviving	
Fall 1949	86	80
Fall 1950	84	77
Fall 1951	70	61

Although these figures suggest that grazing actually increased seedling survival, the differences were not statistically significant.

Grazing did, however, reduce the growth of the seedlings to a significant degree. Thus by the fall of 1949, grazed trees measured 6 inches in height and ungrazed trees 8 inches. By the fall of 1951, grazed trees were 30 inches tall, ungrazed ones 40 inches (fig. 2).

Figure 2.--Three consecutive seasons of cattle browsing reduced the height growth of this slash pine. (Photo by Louisiana Forestry Commission)

It was expected that trees that had lost their terminal buds would grow up bushy or forked. This did not happen. A lateral bud nearly always developed and replaced the terminal shoot. Only 2 percent of the grazed trees had more than one leader in the fall of 1951.

In summary, cattle browsing of slash and loblolly pines on the 4,000-acre Nebo plantations caused no serious or permanent damage, even though it was alarming the first winter.

The Claiborne Plantation

About 15 acres of unfenced cutover land near Melder, Louisiana, was planted with longleaf, loblolly, and slash pine seedlings in February 1948. The area supported a heavy stand of scrub oaks--330 stems per acre, averaging 4.5 inches in diameter at breast height.

Hardwoods on half the tract were girdled or poisoned with Ammate after the pines were planted. This reduction of hardwoods stimulated the growth of grass as well as pines. Cattle were attracted to the released areas and grazed them heavily; by May 1949 they had browsed 40 percent of the loblolly and 25 percent of the slash. Where the hardwoods had not been controlled, 15 percent of the loblolly pines and 4 percent of the slash were browsed. (All the longleaf seedlings had been rooted up by hogs before the spring of 1949!)

The heavier browsing of the loblolly seedlings may have been due to the fact that they were of higher quality when planted and grew more vigorously than the slash pine.

In September 1949, at the end of the second growing season, grazed seedlings were 5 to 7 inches shorter than ungrazed ones. Average seedling heights were:

Species and treatment	Seedling height	
	Grazed	Not grazed
	Inches	
Loblolly pine		
Hardwoods controlled	22	28
Hardwoods not controlled	10	17
Slash pine		
Hardwoods controlled	15	22
Hardwoods not controlled	11	12

The browsed seedlings made good recovery and no other damage surveys were carried out. By February 1955, the pines were 15 to 20 feet high and all evidence of grazing damage had disappeared (fig. 3). This case may be representative of many of the older slash and loblolly plantations in this area--some damage occurred when the seedlings were small, but it was overlooked or forgotten, and the trees have recovered.

The Longleaf Tract Grazing Study

Cattle grazing damage to planted pines is being closely studied on the Longleaf Tract of the Palustris Experimental Forest, at Alexandria. Here a controlled study is being made of forage production, utilization, and vegetation changes caused by grazing, burning, and the growth of pine trees.

On February 29, 1952, 75 longleaf and 75 slash pine seedlings were planted in each of 18 fenced 1/3-acre plots. As the 1952 survival was low--40 percent for longleaf and 60 percent for slash--the dead seedlings were replaced in 1953. Therefore, this study is based on seedlings of two ages. Since 1952, the study plots have been grazed

Figure 3. --Slash and loblolly pine seedlings have remarkable ability to recover from damage. Cattle browsed nearly half of these trees when they were a year old. Now, at age 7, the trees have recovered and average 16 feet in height. (Photo by Louisiana Forestry Commission)

from April to August at three intensities: six plots ungrazed, six moderately grazed, and six heavily grazed. Moderate grazing has averaged 40 cow-days per acre each season, and heavy grazing about 75 cow-days.

Damage to slash pine in 1953 and 1954. --Very little grazing damage was noted in 1952, and no damage survey was made. After the 1953 and 1954 seasons, however, each seedling or planting space was examined. Trees that were expected to recover without permanent injury to their form were listed as slightly or moderately damaged. Heavily damaged seedlings were those expected to die, be deformed, or suffer serious reduction in growth.

Most of the 1953 damage to slash seedlings was from trampling (table 1). The most significant measure of the damage is the striking difference in mortality: 18, 11, and 2 percent for heavy, moderate, and no grazing. The 2-percent mortality of the ungrazed plots was normal. Mortality on the grazed plots above 2 percent was caused by the cattle.

Table 1. --Proportion of slash pine seedlings damaged by grazing. Longleaf Tract 1/

Condition of seedlings	At end of 1953 season			At end of 1954 season		
	No grazing	Moderate grazing	Heavy grazing	No grazing	Moderate grazing	Heavy grazing
	- - -Percent- - -			- - - Percent - - -		
Living						
Lightly or moderately browsed	0	14	15	0	36	25
Heavily browsed	0	1	4	0	2	4
Total browsed	0	15	19	0	38	29
Dead or missing						
Killed by browsing	0	9	16	0	10	19
Normal mortality	2	2	2	5	5	5
Total dead	2	11	18	5	15	24

1/ About half of the seedlings were planted early in 1952 and half in 1953.

In 1954, many pines were 3 to 4 feet high, and the cattle caused more injury by rubbing and browsing than by trampling. By the end of this year, cumulative normal mortality (ungrazed paddocks) was 5 percent, as contrasted with a two-year loss of 15 percent under moderate grazing and 24 percent under heavy grazing (table 1).

The 1954 damage was worst on the moderately grazed areas. The probable reason is that a very heavy rough (2,092 pounds per acre) was left on these plots from 1953. This old rough, mainly wiry flowerstalks of slender bluestem, prevented easy grazing of the new green grass and thus induced browsing of the pines. The heavily grazed plots did not have these unpalatable flowerstalks mixed with the green grass.

Damage to longleaf pine seedlings. --Damage to longleaf seedlings was also surveyed at the end of the 1953 and 1954 growing seasons. In both years most of the loss was from trampling. Very little browsing was noted.

Table 2 sums up the results at the end of 1954. Survival on the ungrazed plots was 86 percent. Some of the surviving ungrazed seedlings were weak, but 60 percent were healthy and, with proper management, will form an adequate stand. It appeared unlikely that a satisfactory stand could be obtained on the grazed plots, where 20 and 34 percent were destroyed by moderate and heavy grazing. In fact, only 42 and 26 percent of the original stand were classed as vigorous in 1954.

Table 2.--Proportion of longleaf pine seedlings damaged by grazing. Longleaf Tract, November 1954 1/

Condition of seedlings	No grazing	Moderate grazing	Heavy grazing
	- - - Percent - - -		
Killed by grazing	0	20	34
Normal mortality	14	14	14
Total survivors	86	66	52
Weak trees	26	24	26
Vigorous trees	60	42	26

1/ About half of the seedlings were planted early in 1952 and half in 1953.

The severe mortality of seedlings from grazing was not noticed or suspected until the survival tallies were made at the end of the grazing seasons (fig. 4). Similar cattle damage has probably contributed to the failure of many longleaf plantations in this area.

Figure 4.--Damage to grass-stage longleaf is not detected without close observation. (Photo by Louisiana Forestry Commission)

Evaluation of damage on the Longleaf Tract.--Certain features of the Longleaf Tract study caused heavier damage to pines than would occur on large, moderately grazed plantations.

First, the small grazing paddocks are only 70 by 210 feet, or not much larger than an average city lot. The cattle were confined to these plots singly or in pairs for 1 to 3 days at a time. There was probably more trampling in these confined plots than would occur in a large pasture (fig. 5).

Figure 5.--This 4-year-old longleaf had just started height growth. The large tender bud split and broke when a cow stepped on it. (Photo by Louisiana Forestry Commission)

Secondly, the forage on each one-third acre consisted of a very uniform stand of slender bluestem grass, a few weeds, and 150 small pine trees. The desire for variety may have encouraged pine grazing.

The third condition that increased cattle damage was that plots were stocked more heavily than is recommended for moderate grazing. Because grass production was high in 1953 and 1954, the grazing rates were increased from 30 to 54 cow-days on the moderately stocked paddocks and from 60 to 90 on the heavily grazed paddocks.

The conspicuous browsing of slash pine seedlings in 1954 was unseasonal. Ordinarily, such browsing occurs only in winter and early spring, when there is not much green forage. However, green grass was not readily available during the 1954 grazing season, simply because it was covered by or mixed with the heavy rough left over from 1953.

The Long-Bell Plantation

A new slash pine plantation of the Long-Bell Lumber Company was severely damaged by open-range cattle and goats during the winter of 1953-54.

The planted area, of 160 acres, supported a scattered stand of scrub oaks but very little underbrush or browse. Grass, though abundant, was dry and unpalatable.

About 60 range beef cattle normally graze this area and an adjoining larger tract of open range. A few days after the pines were planted, the cattle began browsing them. Thereupon the cattle owner penned and fed his herd for more than 2 weeks, but turned them out again on January 15. Grazing damage then became serious and the Southern Forest Experiment Station's Alexandria Research Center was asked to examine the plantation.

One of the first things learned was that a herd of 75 goats also had ranged on the planted area. Most of them had been penned up after grazing the plantation for one day only. However, it was evident from fresh tracks and droppings that some goats still had access to the area. Obviously some of the damage reported here was caused by goats.

The plantation was surveyed on February 5, 1954. By that time, 12 percent of the pines were missing or dead; 28 percent had had their

main stems grazed off, usually down to a short stub; 32 percent were lightly browsed, with no damage to the main stem or terminal bud; and 28 percent were undamaged.

DAMAGE TO DIRECT-SEEDED AREAS

Studies have been under way since 1947 to find reliable techniques for successfully direct-seeding longleaf pine. Most of the work has been done on areas protected from livestock, but several test sites were grazed by cattle. Three such tests are described here.

Turnage Road

In March 1951, a 210-acre block of 16-year-old slash pine on the Palustris Experimental Forest was clear-cut in a salvage operation (it had been ruined by a summer wildfire and several ice storms). The clearcut area was burned in September and October 1951 for seedbed preparation, and cattle and hogs were excluded.

Longleaf pine seed was sown from an airplane on November 28, 1951. In April 1952, the initial stand averaged 2,260 longleaf seedlings per acre.

A heavy growth of coarse weeds and grasses shot up on the seeded area and by June was waist-high and maturing: a serious fire hazard. It was decided to stock the area with cattle to reduce the rank vegetation, even though some grazing damage would result.

On July 1, seven months after seeding, 50 range beef cattle were turned into the pasture, which included the seeded area plus 350 acres of 17-year-old slash pine. The cattle found choice grazing on the seeded area, concentrated there, and effectively reduced the weeds. They were taken out that fall, after 3 months of grazing.

An inventory in November 1952 showed a first-year survival of 1,672 pine seedlings per acre. This represented a loss of 26 percent from April to November, which is not excessive for the critical first summer after seeding. There must have been some seedling mortality from cattle grazing that first summer, but it was not noticeable.

The cattle were returned to the pasture in January 1953. Again, they concentrated on the seeded area. Late in September of the same year it became evident that the seedlings were being seriously browsed and trampled, so the cattle were permanently fenced out.

An inventory in April 1955 showed only 705 seedlings per acre. The mortality between November 1952 and April 1955 was therefore 967 seedlings, or a 58-percent loss. Most of this heavy loss must be attributed to trampling and browsing between January and September 1953.

North Pasture

A test of disking for seedbed preparation was conducted in the North Pasture of the Palustris Experimental Forest in 1951. A 1-1/2-acre plot was double-disked in November and hand-seeded with longleaf pine in early December. The initial catch in April 1952 was 6,150 seedlings per acre. First-year survival, measured in November 1952, was 4,850 seedlings per acre.

Cattle were not permitted on the area until 1953. Then, however, they concentrated on the seeded area and overgrazed it heavily. The pine seedlings were browsed and trampled along with the grass (fig. 6). By November 1953 only 900 seedlings per acre were left. Browsing and trampling had killed most of the rest.

Figure 6.--Browsing of longleaf is common in early spring. Then cows are apt to crop the succulent needles of seedlings that are ready to start height growth. This damage is not as serious as trampling. (Photo by Louisiana Forestry Commission)

The Crosby Seeding Test

In November 1952, Crosby Chemicals, Inc., direct-seeded longleaf pine on 945 acres of cutover land in the south part of Vernon parish. The seed was planted in twin rows on thoroughly disked strips that were 8 feet wide and separated from each other by 9-foot strips of undisturbed light grass sod.

The seeded area was in a 10,000-acre fenced pasture that was grazed by 350 cattle and horses in 1953. The pasture had no cross fences and all of the animals had access to the seeded area. To draw them away, a 1,000-acre block of range in another part of the pasture was burned, but the cattle preferred to graze the succulent new grass and weeds on the disked and seeded strips.

The initial stocking in April 1953 was 972 seedlings per acre. By October, there were only 482 seedlings per acre, a mortality of 50 percent. Since first-summer losses of longleaf seedlings usually do not exceed 25 percent, it appears that trampling and heavy grazing by cattle and horses had caused additional severe loss.

SUMMARY AND RECOMMENDATIONS

These eight examples of cattle grazing damage to pine seedlings are the outstanding instances that have come to the attention of the Alexandria Research Center since 1946. No doubt there have been many other cases of serious grazing damage that were not observed or reported. On the other hand, thousands of acres of successful pine plantations have been established in central and southwest Louisiana on lands open to cattle.

For the future, it would seem wise for landowners to realize that grazing damage to pine trees, either planted or natural, can be a serious matter. The problem is likely to be intensified by recent increases in range cattle numbers and the expanding reforestation program. With more cattle and more trees, there is bound to be much less grass per cow. This will cause heavier grazing and more damage to pines in some areas.

These studies have uncovered some facts that can help landowners decide how much grazing, if any, to permit on new plantations or pine regeneration areas. The major points to consider in making a decision are these:

1. Cattle rarely graze pine foliage where other green forage is available, but some trampling and browsing damage can always be expected

if grazing is permitted the first few years after an area has been seeded or planted to pine.

2. Seedling losses will be excessive where cattle concentrate and over-graze. Such places are watering and feeding grounds, and any part that offers greener, fresher forage than the average surrounding range. Any treatment that removes the old grass or stimulates new grass is apt to attract cattle. Such treatments include burning, disking, scalping, and hardwood control.

3. Browsing of pine seedlings increases when desirable green forage is limited in variety or quantity. This is mostly during late winter and early spring, when both green and dry forage may be sparse. Browsing damage occurs from the early seedling stage until the saplings are too high for cattle to ride them down.

4. Seedling losses from trampling are greatest during the first year after planting and the first two years after seeding. However, losses may remain high for several years if cattle are allowed to concentrate. Rubbing injuries are greatest when the pines are from two to six feet tall.

5. Longleaf suffers heavier losses from trampling than slash or loblolly pine, because the longleaf seedlings remain for several years in the vulnerable grass stage with the large brittle terminal bud close to the ground. Trampling damage to longleaf is hard to see and identify.

6. If grazing is permitted the first few years after planting, it should not start before May 1, and should be moderate--that is, it should be regulated so that not more than half of the green forage is utilized during the entire season. On open, treeless land, with full growth of grass, each adult animal needs about one acre per month. Where trees and brush reduce the grass growth, correspondingly more acreage is required. 1/

7. The only positive way to prevent grazing damage is to keep cattle and all other kinds of livestock out of young plantations until the pines are 6 to 8 feet high. Where this is impractical, grazing should be very carefully controlled and observed.

1/ For information on the grazing capacity of forest range, see:
Bond, W.E., and Campbell, R.S. Planted pines and cattle grazing--a profitable use of southwest Louisiana's cut-over pine land. Louisiana Forestry Commission Bul. 4, 28 pp. 1951.

Campbell, R.S., and Cassady, J.T. Grazing values for cattle on pine forest ranges in Louisiana. Louisiana Agricultural Experiment Station, Louisiana Bul. 452, 31 pp. 1951.